

CLAIMS

What is claimed is:

- 1 1. A semiconductor transistor structure comprising:
  - 2 - a substrate having an epitaxial layer of a first conductivity type;
  - 3 - a source region extending from the surface of the epitaxial layer of a second
  - 4 conductivity type;
  - 5 - a drain region within said epitaxial layer of a second conductivity type;
  - 6 - a channel located between said drain and source regions;
  - 7 - a gate arranged above said channel;
  - 8 - wherein said drain region comprises:
    - 9 - a first region of said second conductivity type for establishing a contact
    - 10 with an electrode;
    - 11 - a second region of said second conductivity type being less doped than
    - 12 said first region being buried within said epitaxial layer and extending
    - 13 from said first region horizontally in direction towards said gate;
    - 14 - a third region being of said second conductivity type less doped than said
    - 15 second region and extending vertically from the surface of said epitaxial
    - 16 layer and horizontally from said second region until under said gate;
    - 17 - a top layer of said first conductivity type extending from the surface of
    - 18 said epitaxial layer to said second region; and
    - 19 - a bottom layer of said first conductivity type extending from said second
    - 20 region into said epitaxial layer.
- 1 2. The semiconductor structure as claimed in Claim 1, wherein said third region
  - 2 comprises a first sub-region of said second conductivity type extending from said
  - 3 second region horizontally towards said gate and a second sub-region of said
  - 4 second conductivity type extending vertically from the surface of said epitaxial
  - 5 layer and horizontally from said first sub-region until under said gate.

- 1    3.     The semiconductor structure as claimed in Claim 2, wherein said first sub-  
2        region being less doped than said second region and said second sub-region being  
3        less doped than said first sub-region.
- 1    4.     The semiconductor structure as claimed in Claim 2, wherein said first sub-  
2        region being less doped than that second region and said first and said second sub-  
3        region overlap and said first sub-region is partially less doped than said second sub-  
4        region.
- 1    5.     The semiconductor structure as claimed in Claim 1, further comprising a  
2        voltage termination of the second conductivity type extending from the electrode  
3        deeper into the epitaxial layer than the first region.
- 1    6.     The semiconductor structure as claimed in Claim 1, further comprising a sinker  
2        structure of said first conductivity type extending from said source region to the  
3        bottom of said epitaxial layer.
- 1    7.     The semiconductor structure as claimed in Claim 6, wherein said substrate is  
2        heavily doped.
- 1    8.     The semiconductor structure as claimed in Claim 1, wherein said second  
2        region has an approximate horizontal length of 1- 3 microns.
- 1    9.     The semiconductor structure as claimed in Claim 1, wherein the first  
2        conductivity type is a p-type and the second conductivity type is an n-type.
- 1    10.    The semiconductor structure as claimed in Claim 1, wherein the first  
2        conductivity type is a n-type and the second conductivity type is an p-type.

- 1 11. A semiconductor transistor structure comprising:
- 2 - a substrate having an epitaxial layer of a first conductivity type;
- 3 - a source region extending from the surface of the epitaxial layer of a second
- 4 conductivity type;
- 5 - a drain region within said epitaxial layer of a second conductivity type;
- 6 - a channel located between said drain and source regions;
- 7 - a gate arranged above said channel;
- 8 - wherein said drain region comprises:
- 9 - a first region of said second conductivity type for establishing a contact
- 10 with an electrode;
- 11 - a second region of said second conductivity type being less doped than
- 12 said first region being buried within said epitaxial layer and extending
- 13 from said first region horizontally in direction towards said gate;
- 14 - a third region of said second conductivity type being less doped than that
- 15 second region and extending from said second region horizontally towards
- 16 said gate;
- 17 - a fourth region of said second conductivity type being less doped than said
- 18 third region and extending vertically from the surface of said epitaxial
- 19 layer and horizontally from said third region until under said gate;
- 20 - a top layer of said first conductivity type extending from the surface of
- 21 said epitaxial layer to said second region; and
- 22 - a bottom layer of said first conductivity type extending from said second
- 23 region into said epitaxial layer.
- 1 12. The semiconductor structure as claimed in Claim 11, further comprising a
- 2 voltage termination of the second conductivity type extending from the electrode
- 3 deeper into the epitaxial layer than the first region.

- 1 13. The semiconductor structure as claimed in Claim 11, further comprising a  
2 sinker structure of said first conductivity type extending from said source region  
3 to the bottom of said epitaxial layer.
- 1 14. The semiconductor structure as claimed in Claim 13, wherein said substrate is  
2 heavily doped.
- 1 15. The semiconductor structure as claimed in Claim 11, wherein said second  
2 region has an approximate horizontal length of 1-3 microns.
- 1 16. The semiconductor structure as claimed in Claim 11, wherein the first  
2 conductivity type is a p-type and the second conductivity type is an n-type.
- 1 17. The semiconductor structure as claimed in Claim 11, wherein the first  
2 conductivity type is a n-type and the second conductivity type is an p-type.

- 1 18. A semiconductor transistor structure comprising:  
2 - a substrate having an epitaxial layer of a first conductivity type;  
3 - a source region extending from the surface of the epitaxial layer of a second  
4 conductivity type;  
5 - a drain region within said epitaxial layer of a second conductivity type;  
6 - a channel located between said drain and source regions;  
7 - a gate arranged above said channel;  
8 - wherein said drain region comprises:  
9 - a first region of said second conductivity type for establishing a contact  
10 with an electrode;  
11 - a second region of said second conductivity type being less doped than  
12 said first region being at least partially buried within said epitaxial layer  
13 and extending from said first region horizontally until under said gate;  
14 - a top layer of said first conductivity type extending from the surface of  
15 said epitaxial layer to said second region; and  
16 - a bottom layer of said first conductivity type extending from said second  
17 region into said epitaxial layer.
- 1 19. The semiconductor structure as claimed in Claim 18, further comprising a  
2 voltage termination of the second conductivity type located on the side of said  
3 drain region opposite the side facing said gate and extending from the surface of  
4 said epitaxial layer.
- 1 20. The semiconductor structure as claimed in Claim 18, further comprising a  
2 sinker structure of said first conductivity type extending from said source region  
3 to the bottom of said epitaxial layer.
- 1 21. The semiconductor structure as claimed in Claim 20, wherein said substrate is  
2 heavily doped.

1 22. The semiconductor structure as claimed in Claim 18, wherein said second  
2 region has an approximate horizontal length of 1- 3 microns.

1 23. The semiconductor structure as claimed in Claim 18, wherein the first  
2 conductivity type is a p-type and the second conductivity type is an n-type.

1 24. The semiconductor structure as claimed in Claim 18, wherein the first  
2 conductivity type is a n-type and the second conductivity type is an p-type.

- 1    25. A semiconductor transistor structure comprising:
- 2        - a substrate having an epitaxial layer of a first conductivity type;
- 3        - a source region extending from the surface of the epitaxial layer of a second
- 4        conductivity type;
- 5        - a drain region within said epitaxial layer of a second conductivity type;
- 6        - a channel located between said drain and source regions;
- 7        - a gate arranged above said channel;
- 8        - wherein said drain region comprises:
- 9            - a first region of said second conductivity type for establishing a contact
- 10           with an electrode;
- 11           - a second region of said second conductivity type being less doped than
- 12           said first region being buried within said epitaxial layer and extending
- 13           from said first region horizontally in direction towards said gate;
- 14           - a third region of said second conductivity type being less doped than that
- 15           second region and extending from said second region horizontally towards
- 16           said gate;
- 17           - a fourth region of said second conductivity type extending vertically from
- 18           the surface of said epitaxial layer and horizontally from said third region
- 19           until under said gate, wherein said third region and said fourth region
- 20           overlap and said overlap is higher doped than said fourth region;
- 21           - a top layer of said first conductivity type extending from the surface of
- 22           said epitaxial layer to said second region; and
- 23           - a bottom layer of said first conductivity type extending from said second
- 24           region into said epitaxial layer.

- 1    26. The semiconductor structure as claimed in Claim 25, further comprising a
- 2       voltage termination of the second conductivity type extending from the electrode
- 3       deeper into the epitaxial layer than the first region.

- 1 27. The semiconductor structure as claimed in Claim 25, further comprising a  
2 sinker structure of said first conductivity type extending from said source region  
3 to the bottom of said epitaxial layer.
- 1 28. The semiconductor structure as claimed in Claim 27, wherein said substrate is  
2 heavily doped.
- 1 29. The semiconductor structure as claimed in Claim 25, wherein said second  
2 region has an approximate horizontal length of 1-3 microns.
- 1 30. The semiconductor structure as claimed in Claim 25, wherein the first  
2 conductivity type is a p-type and the second conductivity type is an n-type.
- 1 31. The semiconductor structure as claimed in Claim 25, wherein the first  
2 conductivity type is a n-type and the second conductivity type is an p-type.
- 1 32. The semiconductor structure as claimed in Claim 25, wherein said third region  
2 is partially less doped than said fourth region.